

National Water-Quality Assessment Program

**Discrete and Continuous Water-Quality Data and Hydrologic
Parameters from Seven Agricultural Watersheds in the United
States, 2002–09**

Data Series 603

Discrete and Continuous Water-Quality Data and Hydrologic Parameters from Seven Agricultural Watersheds in the United States, 2002–09

By Kathleen A. McCarthy, David C. Lampe, and Paul D. Capel

National Water-Quality Assessment Program

Data Series 603

**U.S. Department of the Interior
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Abstract

Field and analytical methods; discrete organic and non-organic water-quality data and associated quality-control data; and continuous hydrologic and water-quality parameters are reported for sites in California, Indiana, Iowa, Maryland, Mississippi, Nebraska, and Washington. The sites were sampled as part of the U.S. Geological Survey National Water-Quality Assessment Program's Agricultural Chemicals Team study to better understand how environmental processes and agricultural practices interact to determine the transport and fate of agricultural chemicals in the environment.

Introduction

In order to gain insights into how environmental processes and agricultural practices interact to determine the transport and fate of agricultural chemicals in the environment, the U.S. Geological Survey (USGS) National Water-Quality Assessment Program's Agricultural Chemicals Team (ACT) conducted in-depth investigations at seven agricultural study areas across the United States from 2002 to 2009 (Capel and others, 2004; Capel and others, 2008a). Samples collected were analyzed for a wide variety of constituents that served as indicators of agricultural contamination and as tracers of environmental and hydrologic processes. Four different groups of constituents were measured—(1) pesticides, (2) pesticide transformation products, (3) nutrients, and (4) major ions, field parameters, organic carbon, and physical parameters. Study areas included the Merced River basin in California, the Sugar

Creek basin in Indiana, the South Fork Iowa River basin in Iowa, the Morgan Creek basin in Maryland, the Bogue Phalia basin in Mississippi, the Maple Creek basin in Nebraska, and the Granger Drain basin in Washington ([fig. 1](#)).

This report provides the data obtained during the course of the ACT studies described above.

Study Sites and Environmental Setting

Site descriptions and environmental settings for the study areas have been reported previously (Frederick and others, 2006; Gronberg and Kratzer, 2006; Hancock and Brayton, 2006; Lathrop, 2006; Payne and others, 2007; Capel and others, 2008b).

Sample Collection, Analytical Methods, and Quality Assurance

Sample collection techniques, analytical methods used, and summary of the quality assurance plan were reported by Capel and others (2008b). Detailed descriptions of sampling sites, such as construction methods used to install wells and depths of open intervals, are provided by Capel and others (2008b) for the Merced River, Sugar Creek, Morgan Creek, Maple Creek, and Granger Drain basins.

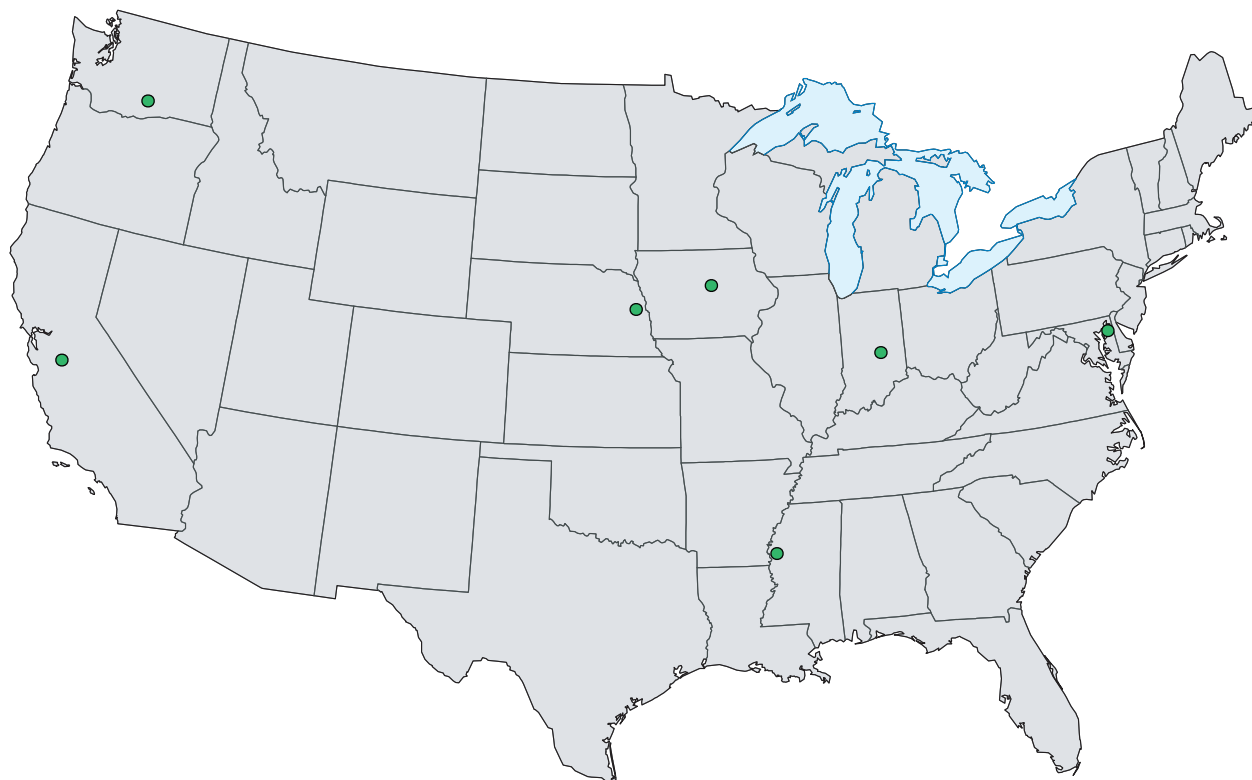


Figure 1. Location of the study areas where samples were collected.

Water-Quality and Hydrologic Data

The water-quality and hydrologic data in appendixes 1–9 are available as Microsoft® Excel 2007 (.xlsx) files at <http://pubs.usgs.gov/ds/603/>.

Discrete Water-Quality Data

Four different groups of constituents were measured in the discrete samples: (1) pesticides ([table 1](#)), (2) pesticide transformation products ([table 2](#)), (3) nutrients ([table 3](#)), and (4) inorganic and field parameters including major ions, field parameters, organic carbon, and physical parameters ([table 4](#)). Discrete water-quality data are presented in electronic format in appendix 1. Quality assurance data for the discrete water-quality data samples are presented in electronic format in appendix 2.

Continuous Hydrologic and Water-Quality Data

The continuous-record data parameters collected varied by study unit and environmental compartment ([table 5](#)). Continuous data parameters available for sites in a particular environmental compartment are listed in [table 6](#). Continuous record data are presented in electronic format in appendixes 3–9. Each appendix contains continuous data collected for an individual study area. Continuous data in each Microsoft® Excel file are divided into multiple worksheets by the environmental compartment in which the data were collected.

Table 1. Pesticides measured during the U.S. Geological Survey National Water-Quality Assessment Program's Agricultural Chemicals Team studies.

[mg/L, milligrams per liter]

Analyte	Chemical registry No.	Matrix	PCODE	Method reporting limit (mg/L)
Amide Herbicides ¹				
Acetochlor	34256-82-1	water, filtered	49260	0.006
Alachlor	15972-60-8	water, filtered	46342	.005
Dimethenamid	87674-68-8	water, filtered	61588	.02
Flufenacet	142459-58-3	water, filtered	62481	.02
Metolachlor	51218-45-2	water, filtered	39415	.013
Pronamide	23950-58-5	water, filtered	82676	.004
Propachlor	1918-16-7	water, filtered	04024	.025
Organophosphate Insecticides				
Azinphos-methyl	86-50-0	water, filtered	82686	0.05
Chlorpyrifos	2921-88-2	water, filtered	38933	.005
Diazinon	333-41-5	water, filtered	39572	.005
Dichlorvos	62-73-7	water, filtered	38775	.0118
Dicrotophos	141-66-2	water, filtered	38454	.0843
Dimethoate	60-51-5	water, filtered	82662	.0061
Ethion	563-12-2	water, filtered	82346	.004
Fenamiphos	22224-92-6	water, filtered	61591	.029
Fonofos	944-22-9	water, filtered	04095	.003
Isofenphos	25311-71-1	water, filtered	61594	.0034
Malathion	121-75-5	water, filtered	39532	.027
Methidathion	950-37-8	water, filtered	61598	.0058
Methyl parathion	298-00-0	water, filtered	82667	.015
Phorate	298-02-2	water, filtered	82664	.011
Phosmet	732-11-6	water, filtered	61601	.0079
Terbufos	13071-79-9	water, filtered	82675	.017
Triazine Herbicides				
Atrazine	1912-24-9	water, filtered	39632	0.007
Metribuzin	21087-64-9	water, filtered	82630	.006
Prometon	1610-18-0	water, filtered	04037	.005
Prometryn	7287-19-6	water, filtered	04036	.0054
Simazine	122-34-9	water, filtered	04035	.005
Terbutylazine	5915-41-3	water, filtered	04022	.0102
Miscellaneous Pesticides (use)				
Benfluralin (herbicide)	1861-40-1	water, filtered	82673	0.01
Carbaryl (insecticide)	63-25-2	water, filtered	82680	.041
Cyfluthrin (insecticide)	68359-37-5	water, filtered	61585	.008
Cypermethrin (insecticide)	52315-07-8	water, filtered	61586	.0086
Dacthal (herbicide)	1861-32-1	water, filtered	82682	.003
Fipronil (insecticide)	120068-37-3	water, filtered	62166	.016
Glyphosate (herbicide)	1071-83-6	water, filtered	62722	.02
Iprodione (fungicide)	36734-19-7	water, filtered	61593	1.4223
Metalaxyl (fungicide)	57837-19-1	water, filtered	61596	.0051
Myclobutanil (fungicide)	88671-89-0	water, filtered	61599	.008
Pendimethalin (herbicide)	40487-42-1	water, filtered	82683	.022
Permethrin, cis (insecticide)	54774-45-7	water, filtered	82687	.006
Tebuthiuron (herbicide)	34014-18-1	water, filtered	82670	.016
Trifluralin (herbicide)	1582-09-8	water, filtered	82661	.009

¹Analytical results for amide parent herbicides are from analyses performed at the USGS National Water Quality Laboratory. Results from the USGS Organic Geochemistry Research Laboratory also are available on request.

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Table 2. Pesticide transformation products measured during the U.S. Geological Survey National Water-Quality Assessment Program's Agricultural Chemicals Team studies.

[–, information not available; µg/L, micrograms per liter]

Analyte	Chemical registry No.	Matrix	PCODE	Parent compound	Method reporting limit (µg/L)
Amide Herbicides ¹					
Acetochlor ESA	–	water, filtered	61029	Acetochlor	0.02
Acetochlor OXA	–	water, filtered	61030	Acetochlor	.02
Acetochlor SAA	–	water, filtered	62847	Acetochlor	.02
Acetochlor ESA - secondary amide	–	water, filtered	62850	Acetochlor	.02
Alachlor ESA	–	water, filtered	50009	Alachlor	.02
Alachlor ESA - secondary amide	–	water, filtered	62849	Alachlor	.02
Alachlor OXA	–	water, filtered	61031	Alachlor	.02
Alachlor SAA	140939-16-8	water, filtered	62848	Alachlor	.02
2-Chloro-2,6-diethylacetanilide	6967-29-9	water, filtered	61618	Alachlor	.005
2,6-Diethylaniline	579-66-8	water, filtered	82660	Alachlor	.006
Dimethenamid ESA	–	water, filtered	61951	Dimethenamid	.02
Dimethenamid OXA	–	water, filtered	62482	Dimethenamid	.02
Flufenacet ESA	–	water, filtered	61952	Flufenacet	.02
Flufenacet OXA	–	water, filtered	62483	Flufenacet	.02
Metolachlor ESA	–	water, filtered	61043	Metolachlor	.02
Metolachlor OXA	–	water, filtered	61044	Metolachlor	.02
2-[(2-Ethyl-6-methylphenyl) amino]-1-propanol	61520-53-4	water, filtered	61615	Metolachlor	.1256
2-Ethyl-6-methylaniline	24549-06-2	water, filtered	61620	Metolachlor	.0045
Propachlor ESA	–	water, filtered	62766	Propachlor	.05
Propachlor OXA	–	water, filtered	62767	Propachlor	.02
Organophosphate Insecticides					
Azinphos-methyl-oxon	961-22-8	water, filtered	61635	Azinphos-methyl	0.07
Chlorpyrifos, oxygen analog	5598-15-2	water, filtered	61636	Chlorpyrifos	.0562
Diazoxon	962-58-3	water, filtered	61638	Diazinon	.01
Ethion monoxon	17356-42-2	water, filtered	61644	Ethion	.0336
Fenamiphos sulfone	31972-44-8	water, filtered	61645	Fenamiphos	.007
Fenamiphos sulfoxide	31972-43-7	water, filtered	61646	Fenamiphos	.031
Fonofos, oxygen analog	944-21-8	water, filtered	61649	Fonofos	.0021
Malaoxon	1634-78-2	water, filtered	61652	Malathion	.008
Methyl paraoxon	950-35-6	water, filtered	61664	Methyl parathion	.0299
Phorate oxon	2600-69-3	water, filtered	61666	Phorate	.0973
Phosmet oxon	3735-33-9	water, filtered	61668	Phorate	.0553
Terbufos sulfone, oxygen analogue	56070-15-6	water, filtered	61674	Terbufos	.0676
Triazine Herbicides					
Deethylatrazine (CIAT)	6190-65-4	water, filtered	04040	Atrazine	0.006
Miscellaneous Pesticides (use)					
1-Naphthol	90-15-3	water, filtered	49295	Carbaryl	.0882
3,4-Dichloroaniline	95-76-1	water, filtered	61625	Linuron	.0045
4-Chloro-2-methylphenol	1570-64-5	water, filtered	61633	MCPA/MCPB	.0056
AMPA ((Aminomethyl)phosphonic acid)	1066-51-9	water, filtered	62649	Glyhosate	–
Desulfinylfipronil	–	water, filtered	62170	Fipronil	.012
Desulfinylfipronil amide	–	water, filtered	62169	Fipronil	.029
Fipronil sulfide	120067-83-6	water, filtered	62167	Fipronil	.013
Fipronil sulfone	120068-36-2	water, filtered	62168	Fipronil	.024

¹Analytical results for amide herbicide products are from analyses performed at the USGS Organic Geochemistry Research Laboratory.

Table 3. Nutrients measured during the U.S. Geological Survey National Water-Quality Assessment Program's Agricultural Chemicals Team studies.

[–, information not available; mg/L, milligrams per liter]

Analyte	Chemical registry No.	Matrix	PCODE	Method reporting limit (mg/L)
Nitrogen, ammonia	2105357	water, filtered	00608	0.04
Nitrogen, ammonia + organic, N	17778-88-0	water, whole	00625	.03
Nitrogen, ammonia + organic, N	17778-88-0	water, filtered	00623	.03
Nitrogen, ammonia, field	2105357	water, filtered	99120	–
Nitrogen, nitrate, field	84145-82-4	water, whole	99121	–
Nitrogen, nitrite	14797-65-0	water, filtered	00613	.008
Nitrogen, nitrite + nitrate	–	water, filtered	00631	.06
Nitrogen, nitrate	84145-82-4	water, filtered	71851	–
Nitrogen, nitrite	14797-65-0	water, filtered	71856	–
Nitrogen, total	–	water, whole	62854	.1
Nitrogen, total	–	water, whole	62855	.1
Phosphorus, phosphate, ortho	14265-44-2	water, filtered	00671	.006
Phosphorus, phosphate, ortho, field	14265-44-2	water, filtered	99122	–
Phosphorus, total	7723-14-0	water, whole	00665	.004

Table 4. Major ions, field parameters, organic carbon, and physical parameters measured during the U.S. Geological Survey National Water-Quality Assessment Program's Agricultural Chemicals Team studies.

[–, information not available; mg/L, milligrams per liter]

Analyte	Chemical registry No.	Matrix	PCODE	Method reporting limit (mg/L)
Inorganic Parameters				
Alkalinity, field	–	water, filtered	00418	–
Alkalinity, laboratory	–	water, filtered	29801	–
Alkalinity, laboratory	–	water, filtered	29802	–
Bromide	24959-67-9	water, filtered	71870	0.016
Calcium	7440-70-2	water, filtered	00915	.01
Chloride	16887-00-6	water, filtered	00940	.2
Dissolved oxygen, field	–	water, whole	00300	–
Fluoride	16984-48-8	water, filtered	00950	.17
Hydrogen sulfide, field	–	water, whole	71875	–
Iron	7439-89-6	water, filtered	01046	.0064
Iron (II), field	–	water, filtered	99114	–
Magnesium	7439-95-4	water, filtered	00925	.008
Manganese	7439-96-5	water, filtered	01056	.0008
pH, field	–	water, whole	00400	–
pH, laboratory	–	water, whole	00403	–
Potassium	2023695	water, filtered	00935	.16
Residue on evaporation, 180°C	–	water, filtered	70300	10
Silica	7631-86-9	water, filtered	00955	.04
Sodium	7440-23-5	water, filtered	00930	.1
Specific conductance, field	–	water, whole	00095	–
Specific conductance, laboratory	–	water, whole	90095	2.6
Sulfate	14808-79-8	water, filtered	00945	.18
Sulfate, field	14808-79-8	water, filtered	99113	–
Sulfide, field	–	water, filtered	99118	–

Table 4. Major ions, field parameters, organic carbon, and physical parameters measured during the U.S. Geological Survey National Water-Quality Assessment Program's Agricultural Chemicals Team studies.—Continued

[–, information not available; mg/L, milligrams per liter]

Analyte	Chemical registry No.	Matrix	PCODE	Method reporting limit (mg/L)
Organic Parameters				
Dissolved organic carbon	–	water, filtered	00681	0.33
Specific UV absorbance (SUVA)	–	water, filtered	63162	–
Total inorganic carbon	–	water, whole	00608	.12
Total inorganic carbon	–	water, whole	00688	.12
Total carbon	–	water, whole	00694	.12
Total organic carbon	–	water, whole	00689	.12
Total particulate nitrogen	17778-88-0	water, whole	49570	.022
Physical Parameters				
Suspended sediment	–	water, whole	80154	–
Suspended sediment, % smaller than 0.0625 mm	–	water, whole	70331	–
Temperature, field	–	water, whole	00010	–

Table 5. Environmental compartments with continuous data measured during the U.S. Geological Survey National Water-Quality Assessment Program's Agricultural Chemicals Team studies.

Study area	NAWQA study unit	Period of data collection (water years)	Surface water	Groundwater	Groundwater-surface-water interface	Unsaturated zone	Overland flow	Tile drain
ACT Network Code:			(SW)	(GW)	(GS)	(UZ)	(OV)	(TD)
Merced River Basin, California	SANJ	2003–04	x	x	x	x		
Sugar Creek Basin, Indiana	WHMI	2003–04	x	x	x	x		x
South Fork Iowa River Basin, Iowa	EIWA	2006–09	x	x	x		x	x
Morgan Creek Basin, Maryland	PODL	2003–04	x	x	x			
Bogue Phalia Basin, Mississippi	MISE	2006–10	x	x	x	x		
Maple Creek Basin, Nebraska	CNBR	2003–04	x	x	x			
Granger Drain Basin, Washington	CCYK	2003–04	x	x	x	x		

Table 6. Parameters measured using continuous data-collection monitors.

[Analyses were performed on whole water; parameters generally were measured at 15-minute intervals]

Name	PCODE
Surface Water (SW)	
Discharge	00060
Temperature	00010
Specific conductance	00095
Dissolved oxygen	00300
pH	00400
Stream water level elevation above NAVD 1988	63160
Gage height	00065
Elevation above NGVD 1929	72020
Groundwater (GW)	
Elevation above NGVD 1929	72020
Groundwater level above NAVD 1988	62611
Depth below land surface	72019
Temperature	00010
Moisture content	74207
Specific conductance	00095
Groundwater-Surface-Water Interaction (GS)	
Dissolved oxygen	00300
pH	00400
Temperature	00010
Specific conductance	00095
Stream water level elevation above NAVD 1988	63160
Groundwater level above NAVD 1988	62611
Depth below land surface	72019
Unsaturated Zone (UZ)	
Soil water matric potential	72133
Moisture content	74207
Temperature	00010
Overland Flow (OV)	
Discharge	00060
Temperature	00010
Specific conductance	00095
Tile Drain (TD)	
Discharge	00060
Temperature	00010
Specific conductance	00095

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Appendix 1. Discrete Water-Quality Data Collected During the U.S. Geological Survey National Water-Quality Assessment Program's Agricultural Chemicals Team Studies.

The Microsoft® Excel spreadsheet ds603_App1_WQ_DD.xlsx contains a worksheet named A1 Notes that describes the documentation and abbreviations used in appendix 1. The spreadsheet also contains discrete water-quality data for samples collected during 2002–09 (worksheet in appendix 1).

Appendix 2. Quality Assurance Data Collected During the U.S. Geological Survey National Water-Quality Assessment Program's Agricultural Chemicals Team Studies.

The Microsoft® Excel spreadsheet ds603_App2_QA.xlsx contains a worksheet named A2 Notes that describes the documentation and abbreviations used in appendix 2. The spreadsheet also contains quality assurance data for samples collected during 2002–09 (worksheet in appendix 2).

Appendixes 3–9. Continuous Hydrologic and Water-Quality Data Collected During the U.S. Geological Survey National Water-Quality Assessment Program's Agricultural Chemicals Team Studies.

ds603_Appendixes.zip

Continuous hydrologic and water-quality data for each study basin have been separated into individual water years. The data for each water year are presented in a Microsoft® Excel workbook. Each workbook contains a “note” worksheet that describes the documentation and abbreviations used in the workbook. Workbooks also contain separate worksheets for each environmental compartment from which data were collected in that study basin ([table 5](#)): surface-water (SW), groundwater (GW), groundwater surface-water interface (GS), unsaturated-zone (UZ), overland flow (OV), and tile-drains (TD).

Appendix 3. Merced River Basin, California.

Continuous hydrologic and water-quality data for the Merced River basin collected during water years 2003–04 can be found in the following Microsoft® Excel spreadsheets:

ds603_App3_Merced_CD_WY2003.xlsx

ds603_App3_Merced_CD_WY2004.xlsx

Appendix 4. Sugar Creek Basin, Indiana.

Continuous hydrologic and water-quality data for the Sugar Creek basin collected during water years 2003–04 can be found in the following Microsoft® Excel spreadsheets:

ds603_App4_Sugar_Creek_CD_WY2003.xlsx

ds603_App4_Sugar_Creek_CD_WY2004.xlsx

Appendix 5. South Fork Iowa River Basin, Iowa.

Continuous hydrologic and water-quality data for the South Fork Iowa River basin collected during water years 2006–09 can be found in the following Microsoft® Excel spreadsheets:

ds603_App5_SF_Iowa_River_CD_WY2006.xlsx

ds603_App5_SF_Iowa_River_CD_WY2007.xlsx

ds603_App5_SF_Iowa_River_CD_WY2008.xlsx

ds603_App5_SF_Iowa_River_CD_WY2009.xlsx

Appendix 6. Morgan Creek Basin, Maryland.

Continuous hydrologic and water-quality data for the Morgan Creek basin collected during water years 2003–04 can be found in the following Microsoft® Excel spreadsheets:

ds603_App6_Morgan_Creek_CD_WY2003.xlsx

ds603_App6_Morgan_Creek_CD_WY2004.xlsx

Appendix 7. Bogue Phalia Basin, Mississippi.

Continuous hydrologic and water-quality data for the Bogue Phalia basin collected during water years 2006–10 can be found in the following Microsoft® Excel spreadsheets:

ds603_App7_Bogue_Phalia_CD_WY2006.xlsx

ds603_App7_Bogue_Phalia_CD_WY2007.xlsx

ds603_App7_Bogue_Phalia_CD_WY2008.xlsx

ds603_App7_Bogue_Phalia_CD_WY2009.xlsx

ds603_App7_Bogue_Phalia_CD_WY2010.xlsx

Appendix 8. Maple Creek Basin, Nebraska.

Continuous hydrologic and water-quality data for the Maple Creek basin collected during water years 2003–04 can be found in the following Microsoft® Excel spreadsheets:

ds603_App8_Maple_Creek_CD_WY2003.xlsx

ds603_App8_Maple_Creek_CD_WY2004.xlsx

Appendix 9. Granger Drain Basin, Washington.

Continuous hydrologic and water-quality data for the Granger Drain basin collected during water years 2003–04 can be found in the following Microsoft® Excel spreadsheets:

ds603_App9_Granger_Drain_CD_WY2003.xlsx

ds603_App9_Granger_Drain_CD_WY2004.xlsx

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